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Distance estimation to supernova SN 2024ws using the EPM and SCM methods and assessing their applicability based on physical modeling type IIP supernovae.

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Type IIP supernovae provide an opportunity for independent estimation of cosmological distances, making them a valuable tool for constraining the Hubble constant and testing cosmological models. One of the methods for determining distances to Type II supernovae is the Expanding Photosphere Method (EPM), which does not require calibration via the cosmic distance ladder. The EPM is based on the geometric relationship between the angular size of the supernova photosphere and its radius. The angular size of the photosphere is estimated from photometric observations in different photometric bands, while its radius can be determined from the photospheric expansion velocity measured from spectral lines. These quantities can then be used to estimate the distance to the supernova.

This work presents a practical algorithm for applying the EPM and the Standardized Candle Method (SCM) to photometric and spectroscopic observational data obtained with a telescope at the Caucasus Mountain Observatory of the Sternberg Astronomical Institute, Lomonosov Moscow State University. For supernova SN 2024ws, distances obtained using the two methods are estimated and comparatively analyzed. The validity of the physical assumptions underlying the EPM and SCM is investigated using numerical modeling type IIP supernovae.

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